

# PATENT ABSTRACTS OF JAPAN

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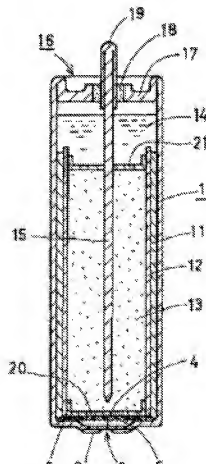
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## (54) HERMETIC SEAL LIQUID ACTIVE MATERIAL BATTERY

### (57)Abstract:

**PURPOSE:** To get a battery highly reliable on the operation of explosionproof function by providing a thin part at the bottom of a battery container, using oxyhalide of liquid for a positive active material, and alkaline metal or its alloy for a negative pole.

**CONSTITUTION:** A compound 14 being liquid at normal temperature such as thionyl chloride, sulfuryl chloride, phospholi chloride, etc., is used for a positive active material. Li, Na, K, or alloy having these materials for its base material is used for a negative electrode. A thin part 4 is provided at the bottom 2 of a battery container 1. A wire gauze or a porous substance 5 of metal such as an expand metal, punching metal, etc., is arranged at the inside of the bottom, and the periphery is spot-welded to the inside of the bottom 2 of the container 1. The thin part breaks by the abnormal rise of the inner pressure of a battery, which prevents the bursting under high pressure.





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**CLAIMS**

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[Claim(s)]

[Claim 1]A oxy halogenide of a fluid is used as positive active material at ordinary temperature, such as a thionyl chloride, a sulfuric chloride, and a phosphoryl chloride, An alkaline metal alloy which uses alkaline metals or those alkaline metals, such as lithium, sodium, and potassium, as a base material is used for a negative electrode, A hermetic-sealing fluid active material cell welding a metal porous body to a bottom inner face of a battery container in a hermetic-sealing fluid active material cell which obturates an opening of a battery container which formed a thin-walled part for explosion protection in a pars basilaris ossis occipitalis with a battery lid provided with hermetic sealing.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to the hermetic-sealing fluid active material cell which improved the working reliability of the explosion-proof function in more detail with respect to the hermetic-sealing fluid active material cell provided with the explosion-proof function.

[0002]

[Description of the Prior Art]The oxy halogenide of a fluid is used as positive active material at ordinary temperature, such as a thionyl chloride, a sulfuric chloride, and a phosphoryl chloride, By what is called a fluid active material cell used for a negative electrode, the alkaline metal alloy which uses alkaline metals or those alkaline metals, such as lithium, sodium, and potassium, as a base material. Since it is very easy to react with water also to positive active material and negative-electrode structure material, in order to raise a seal degree, obturation using hermetic sealing is adopted as obturation of the opening of a battery container which accommodated them.

[0003]By the way, the cell obturated using this hermetic sealing, When the abnormal circumstances of it being exposed under heating at high temperature, or charging by high tension are encountered on the other hand since sealing nature is high although sealing nature has the strong point of excelling in keeping highly, The pressure inside a cell rises unusually, a cell explodes, and a loud explosive sound occurs, and there is a possibility of cell contents scattering around and soiling a cell use device.

[0004]Therefore, when a cross shape thin-walled part is formed in the pars basilaris ossis occipitalis of a battery container and the pressure inside a cell begins to rise unusually, are making what is called an explosion-proof function to prevent the burst of the cell under high voltage when the above-mentioned thin-walled part breaks have, but. Since the pressure buildup was too intense although a thin-walled part carries out \*\*\*\* destruction when the examination which switches on a cell in fire is done, in order to confirm safety when accidentally supplied in fire, the \*\*\*\* destructive portion was closed by positive electrode mixture and the separator, and there was a fault that a cell exploded under high voltage.

[0005]

[Problem(s) to be Solved by the Invention]This invention solves the problem of exploding under high voltage, when the above-mentioned conventional hermetic-sealing fluid active material cell is exposed to abnormally high temperature, and it improves the working reliability of an explosion-proof function, and an object of this invention is to provide the hermetic-sealing fluid active material cell excellent in safety.

[0006]

[Means for Solving the Problem] This invention attains the above-mentioned purpose by welding metal porous bodies, such as a wire gauze, an expanded metal, and a punching metal, to a bottom inner face of a battery container which provided a thin-walled part for explosion protection in a pars basilaris ossis occipitalis.

[0007] Namely, if it welds to a bottom inner face of a battery container by spot welding etc. so that the above-mentioned metal porous body may cover a thin-walled part, Even when a cell is exposed under abnormally high temperature, an anode and a separator are prevented from plugging up a \*\*\*\* destructive portion of a thin-walled part with the above-mentioned metal porous body, the explosion-proof function of a thin-walled part operates normally, and the safety of a cell is secured.

[0008] Below, an example of composition of a hermetic-sealing fluid active material cell of this invention is shown, referring to Drawings.

[0009] Drawing 1 is a sectional view showing an example of a hermetic-sealing fluid active material cell of this invention.

[0010] In drawing 1, 1 is a battery container, and this battery container 1 is produced by usually carrying out spinning of the 0.2-0.5-mm-thick stainless steel plate to closed-end cylindrical shape, is made to \*\*\*\* a center portion of that pars basilaris ossis occipitalis 2, and is using it as the salient 2a.

[0011] The slot 3 is formed in a place of the salient 2a of the pars basilaris ossis occipitalis 2 of the above-mentioned battery container 1 at cross shape, and the thin-walled part 4 for explosion protection is formed in cross shape.

[0012] And the metal porous body 5 is arranged to the bottom inner face side of the above-mentioned battery container 1, and spot welding of the peripheral part of the metal porous body 5 is carried out to the inner surface side of a pars basilaris ossis occipitalis of the battery container 1. As the above-mentioned metal porous body 5, a wire gauze, an expanded metal, a punching metal, etc. are used, for example.

[0013] This battery lid 16 consists of the body 17, the insulating layer 18, and the positive pole terminal 19, as for an anode and 14, a negative electrode and 12 are [ a positive pole collector and 16 ] battery lids an electrolysis solution and 15 a separator and 13 11, and 21 is [ 20 is a pars-basilaris-ossis-occipitalis insulation material, and ] a top insulation material.

[0014] The above-mentioned negative electrode 11 makes cylindrical a sheet of an alkaline metal alloy which uses alkaline metals or those alkaline metals, such as lithium, sodium, and potassium, as a base material, Formed by being stuck to inner skin of said battery container 1 by pressure, the separator 12 consists of glass fiber nonwoven fabrics, is carrying out cylindrical shape, and has isolated the cylindrical shape above-mentioned negative electrode 11 and the cylindrical anode 13.

[0015] The anode 13 uses acetylene black as the main ingredients, becomes this from a porosity Plastic solid of material which uses as a principal member carbonaceous which added black lead and polytetrafluoroethylene, and what is called a carbon porosity Plastic solid, and is carrying out cylindrical shape.

[0016] A oxy halogenide of a fluid is used as a solvent at ordinary temperature which is positive active material, such as a thionyl chloride, a sulfuric chloride, and a phosphoryl chloride, and the electrolysis solution 14 is prepared by dissolving supporting electrolytes, such as  $\text{LiAlCl}_4$ , in this oxy halogenide.

Thus, unlike other cells, with the relation in which a oxy halogenide of positive active material serves as

a solvent of an electrolysis solution, a lot of electrolysis solutions 14 are poured in into a cell by this cell. [0017]Itself does not react and said anode 13 serves as a reaction field place with a lithium ion etc. which have been ionized and eluted from a oxy halogenide and the negative electrode 11 of positive active material so that it may understand also from a oxy halogenide being positive active material. [0018]The positive pole collector 15 consists of a nickel stick, the battery lid 16 has the body 17, the insulating layer 18, and the positive pole terminal 19 as mentioned above, the body 17 is formed with stainless steel, and the peripheral part which rose is joined to an open end of said battery container 1 by welding.

[0019]While the insulating layer 18 consists of glass, it is formed in the inner circumference side of the body 17 and this insulating layer 18 insulates the body 17 and the positive pole terminal 19, What is called hermetic-sealing structure that the composition glass welded to inner skin of the body 17 in a peripheral face, and the composition glass welded to a peripheral face of the positive pole terminal 19 in inner skin, and combined and closed between the body 17 and the positive pole terminals 19 is adopted. [0020]By a product made from stainless steel, the part is carrying out pipe shape at the time of a battery assembly, and is used as an electrolysis solution inlet, and the positive pole terminal 19 is welded with the upper part of the positive pole collector 15 in which the upper bed part was inserted into the centrum after electrolysis solution pouring, and is closed.

[0021]The lower isolator 20 consisted of the same glass fiber nonwoven fabric as the separator 12, and has prevented contact with the anode 13 and the battery container 1. The top isolator 21 consists of the same glass fiber nonwoven fabric as the separator 2, and the anode 13 and the body 17 of the battery lid 16 which serves both as a negative pole terminal are kept from carrying out direct contact.

[0022]In a cell of this invention, a oxy halogenide of a fluid is used as positive active material as mentioned above at ordinary temperature (25 \*\*), such as a thionyl chloride, a sulfuric chloride, and a phosphoryl chloride.

[0023]These oxy halogenide is used as a solvent of an electrolysis solution while it is positive active material, An electrolysis solution is prepared by dissolving supporting electrolytes, such as  $\text{LiAlCl}_4$ ,  $\text{LiAlBr}_4$ ,  $\text{LiGaCl}_4$ , and  $\text{LiB}_{10}\text{Cl}_{10}$ , in these oxy halogenides. In preparation of an electrolysis solution, supporting electrolytes, such as  $\text{LiAlCl}_4$ , add  $\text{LiCl}$  and  $\text{AlCl}_3$  to a oxy halogenide, and exist in a form of  $\text{LiAlCl}_4$  in an electrolysis solution. (However ionizing  $\text{Li}^+$  ion and  $\text{AlCl}_4^-$  ion existence) It may be made to carry out.

[0024]

[Example]Below, working example is given and this invention is explained more concretely.

[0025]The hermetic-sealing fluid active material cell of the outer diameter of 14 mm and 50 mm in height a thionyl chloride lithium system was produced with the structure based on working example 1 above-mentioned drawing 1.

[0026]The battery container 1 is a product made from stainless steel, and the thickness is 0.3 mm and it has formed the 0.09-mm-thick thin-walled part 4 in cross shape by forming in the salient 2a of the pars basilaris ossis occipitalis 2 the slot 3 (however, the above-mentioned shape is a case where it sees from the pars-basilaris-ossis-occipitalis side of the slot 3) of section handstand trapezoidal shape at cross shape.

[0027]As the metal porous body 5, mesh size  $\text{LW3.0 mm} \times \text{SW1.0mm}$ , Using the expanded metal made

from nickel (W= 0.20 mm and t= 0.1 mm), this expanded metal is pierced in a circle with an outer diameter of 12.8 mm, it arranges to the inner surface side of the pars basilaris ossis occipitalis 2 of the battery container 1, and the circumference is spot-welded six times.

[0028]The lithium volume of a negative electrode is 530 mg, and the theoretical electric capacity of this lithium is 2047mAh. Acetylene black of an anode is 893 mg, the injection rate of an electrolysis solution is 4 ml, and the theoretical electric capacity of the thionyl chloride of positive active material is about 2640 mAh(s).

[0029]Except for not arranging the metal porous body 5 to the inner surface side of the pars basilaris ossis occipitalis 2 of the comparative example 1 battery container 1, the cell of the same composition as working example 1 was produced.

[0030]The cell of above-mentioned working example 1 and the cell of the comparative example 1 were switched on in every 20-piece fire, and it was investigated whether a cell would explode in fire. The result is shown in Table 1. The denominator of the column of the "burst-among fire cell number" in Table 1 shows the cell number with which the examination was presented, and a numerator shows the cell number which produced a burst among fire.

[0031]

[Table 1]

	火中破裂電池個數
實 施 例 1	0 / 20
比 較 例 1	8 / 20

[0032]As shown in Table 1, in the comparative example 1 which is conventionally equivalent to elegance, a burst among fire arose on eight cells in 20 cells, but working example 1 of this invention does not have what produces a burst among fire, and the explosion-proof function by the thin-walled part 4 was operating normally.

[0033]

[Effect of the Invention]the explosion-proof function according to a thin-walled part by arranging a metal porous body in this invention to the inner surface side of the pars basilaris ossis occipitalis of a battery container which provided the thin-walled part for explosion protection in the pars basilaris ossis occipitalis, and fixing the peripheral part to the bottom inner face of a battery container by welding, as explained above -- reliability -- it was able to be made to operate highly

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